

CLAIMS

What is claimed is:

1. An apparatus comprising:
a plurality of photodetector elements disposed on a semiconductor
5 substrate; and
a compound light directing member including a plurality of light directing
elements, at least some of the light directing elements to individually direct light
energy from one or more sources onto one or more of the photodetector
elements, the compound light directing member being the primary mechanism to
10 direct light energy onto the one or more of the photodetector elements,
outputs of the photodetector elements being electrically coupled such that
an image associated with one or more sources may be synthesized at output
circuitry.

15 2. The apparatus of claim 1 wherein the compound light directing
member comprises a lenslet array.

3. The apparatus of claim 1 wherein the compound light directing
member comprises a light pipe bundle.

20 4. The apparatus of claim 3 wherein the light pipe bundle includes first
and second light pipes, the first light pipe having an external surface that is at a
first angle relative to the substrate to preferentially receive light from a first

direction, the second light pipe having an external surface that is at a second angle relative to the substrate to preferentially receive light from a second direction, the first and second angles and first and second directions being different from each other.

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5. The apparatus of claim 1 wherein the compound light directing member comprises a plurality of micromachined light directing elements, each of the micromachined light directing elements including an opening, the apparatus further comprising

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micromachine control circuitry to control an orientation of at least some of the micromachined light directing elements relative to a surface of the substrate, the orientation of each of the light directing elements to determine the light energy received by an underlying photodetector element.

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6. The apparatus of claim 5 wherein the orientation of a first set of the micromachine control elements relative to the substrate is controllable to be different than the relative orientation of a second set of the micromachine control elements.

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7. An apparatus comprising:
a compound exposure determining member coupled to a substrate, the compound exposure determining member including a plurality of light scanning

elements, each of the light scanning elements including an integrated photodetector; and

micromachine control circuitry to control an orientation of at least some of the light scanning elements relative to the substrate to determine a direction from
5 which light is received at the respective integrated photodetectors.

8. The apparatus of claim 7 wherein the micromachine control circuitry is to control a first set of the light scanning elements to be at a different relative orientation than a second set of the light scanning elements.

9. The apparatus of claim 7 further including
output circuitry to provide at least one image corresponding to light
sources that provide light received at the photodetectors.

10. An apparatus comprising:
a light directing member including a plurality of light directing elements;
and
an array of photodetector elements disposed on a single integrated circuit device, a set of the photodetector elements being coupled to receive light energy
20 from a source via one or more of the light directing elements, the set of the photodetector elements being wired to produce an image corresponding to the source at output circuitry to be coupled to the set of the photodetector elements,

wherein the light directing member and the single integrated circuit device together provide a substantially planar, artificial, compound eye.

11. The apparatus of claim 10 wherein the light directing member
5 comprises a lenslet array and the light directing elements each comprise a lenslet.

12. The apparatus of claim 10 wherein the light directing member
10 comprises a light pipe bundle and the light directing elements each comprise a light pipe.

13. The apparatus of 10 wherein
the light directing member comprises a plurality of micromachined light directing elements, each of the micromachined light directing elements including
15 an opening, the apparatus further comprising
micromachine control circuitry to control an orientation of the
micromachined light directing elements relative to a surface of the integrated circuit device, the relative orientation of each of the micromachined light directing elements to determine a direction from which light is received at one or more
20 underlying photodetectors.

14. The apparatus of claim 13 wherein

the micromachine control circuitry is to control a first set of the micromachine control elements to be at a different relative angle than a second set of the micromachine control elements with respect to the surface of the integrated circuit to enable the capture of multiple images.

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15. A method comprising:

determining from which angles and which point sources light energy is directed to associated photodetector elements integrated on a single substrate using a compound exposure determining member;

10 producing an output signal at each photodetector that is responsive to the light energy received by the respective photodetector; and

integrating outputs of the photodetector elements to produce an image associated with the point sources.

15 16. The method of claim 15 wherein

determining from which angles and which point sources light energy is directing to associated photodetector elements includes using a lenslet array.

17. The method of claim 15 wherein

20 determining from which angles and which point sources light energy is directing to associated photodetector elements includes using a light pipe bundle.

18. The method of claim 15 wherein
determining from which angles and which point sources light energy is
directing to associated photodetector elements includes using controllable
micromachine light directing elements.

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19. A method comprising:
providing an array of photodetector elements disposed on a
semiconductor substrate;
providing a light directing member including a plurality of light directing
10 elements, at least some of the light directing elements to individually direct light
energy from a source onto one or more of the photodetector elements; and
providing a compound eye wiring to integrate outputs of the photodetector
elements to produce an image corresponding to the source.

15 20. The method of claim 19 wherein providing a light directing member
includes providing a microlens array.

21. The method of claim 19 wherein providing a light directing member
includes providing a light pipe bundle.

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22. The method of claim 19 wherein providing a light directing member
includes providing micromachine light directing elements.